Pumice stone

Environmental Product Declaration

Programme The International EPD® System
Programme operator EPD International AB
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in accordance with ISO 14025 and 15804:2012+A2:2019

EPD® THE INTERNATIONAL EPD® SYSTEM

ECO PLATFORM EPD EN 15804 VERIFIED

LAVA MINING AND QUARRYING Co

COMPANY INFORMATION

LAVA MINING & QUARRYING SA was established in 1952 to operate the pumice stone Municipal Quarry located on Yali island to the north of Nissiros. The company was integrated into Heracles Group in 1977 and began expanding to new activities in 1980 by acquiring the Gypsum Quarry at Altsi, Sitia. In 1989, LAVA began to operate the pozzolana rock quarry in Milos, while the silica sand quarry on the same island started operating in 1996.
With its considerable export sales, the Company features one of the most dynamic development rates in its trade.

Heracles Group is a member of Holcim Group, the worldwide leader in building materials.

LAVA MINING & QUARRYING SA is certified to ISO 9001, CE according to EN 13055-1:2002 and EN 13055-2 standards for its pumice stone quarry.

Presence in Greece

Expertise

LAVA MINING & QUARRYING SA principal activity is raw material quarrying. With a special rehabilitation plan for each quarry, the company's objective is to deliver an area with enhanced biodiversity, compared to its condition before the intervention, and improve the landscape created following the intervention.

Products

LAVA MINING & QUARRYING SA operates extraction, treatment and trading facilities for pumice stone in Yali, Nissiros, for gypsum in Altsi, Crete and for pozzolane rock and silica sand on Milos Island.

WHAT MAKES US DIFFERENT

We add value in local partnerships, making use of our products, equipment, know-how and expertise and contributing to initiatives related to our priorities, including public Health and Safety, education, environment, and local infrastructure projects. Our quarries contribute significantly through their operation to the economic and social development of local communities.

Areas of Application

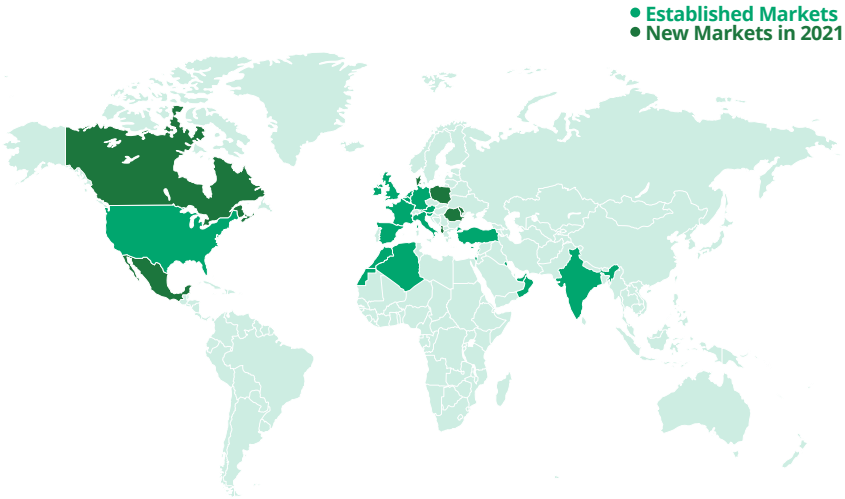
LAVA's Pumice Stone is mainly suitable for construction applications such as the production of lightweight structural elements (lightweight pumice blocks), of lightweight concrete, of lightweight precast elements, of lightweight insulation coatings and floor fillings. Also, it can be used in cultivations, geotechnical projects and other applications (textiles, water, animals).

LAVA MINING & QUARRYING SA holds an extended portfolio of sales network, not only tracked in domestic market but also exports to various countries around the globe.

Markets

LAVA MINING & QUARRYING SA exports to European countries, the Middle East, Africa, Central and North America and Asia.

Global Presence



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PRODUCT DESCRIPTION

The studied product is a chemically inert porous volcanic mineral created by an undersea volcanic eruption of the Nissiros region 10.000 years ago. Its porosity is owed to the vacuums caused by escaping steam as lava cooled down. **LAVA MINING & QUARRYING SA** Pumice Stone is an absolutely natural resource that is used as an industrial quality solution of added value, all over the world.

LAVA's quarry production capacity meets approximately 1.000.000 TN / year and is certified to ISO 9001 for its systematic approach to quality.

LAVA MINING & QUARRYING SA Pumice Stone, as a natural raw material, totally environmentally friendly, combines without any chemical process:
- **Homogenous quality**
- **Low specific weight**
- **Stable homogenous white color**
- **Thermal insulating & soundproofing properties**
- **High mechanical strength**

LAVA's Pumice Stone is mainly used for construction applications. A list of potential applications is mentioned below:
- **Building applications**
- **Geotechnical uses**
- **Agricultural uses**
- **Industrial uses**

LAVA MINING & QUARRYING SA pumice stone's extraordinary qualities have been utilized by numerous industries worldwide over several decades to produce high-quality building materials that comply with international regulations and meet contemporary building requirements.

The high quality of LAVA pumice stone is guaranteed by its compliance with the European Standards CE EN 13055-1: 2002 (Lightweight aggregates for concrete, mortar and grout) and CE EN 13055-2: 2004 (Lightweight aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas).

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The product's technical characteristics and composition are presented at the tables below.
Product declarations and certificates can be found at the company's website www.lava.gr.
For further information please contact christos.galmpenis@lafarge.com

Physical Properties	
Odour	Odourless
pH	~8
Water content (%)	16-26
Melting point (oC)	1300-1600
Bulk density (wet basis) (kg/m3)	640-940
Crushing resistance (MPa) – EN 1055-1 A	4,9

Safety
✓ **Non-combustible**
✓ **Fire resistant**
Porous structure
✓ **Thermal insulation**
✓ **Sound insulation**
✓ **Internal concrete curing**
✓ **Surface interlocking**

The chemical composition of the reference product is reported indicatively in the following table.

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH Regulations that exceed 0.1% of the total weight.

Contribution (% w/w) of materials to the declared unit	
Silicon dioxide (SiO_2)	68.4 – 71.6
Aluminium oxide (Al2O3)	11.3 – 11.7
Ferric oxide (Fe2O3)	1.1 – 1.2
Calcium oxide (CaO)	0.7 – 2.6
Magnesium oxide (MgO)	0.2 – 0.7
Sulphur trioxide (SO_3)	0.0 – 0.1
Potassium oxide (K_2O)	4.0 – 4.3
Sodium oxide (Na_2O)	3.4 – 3.7
Calcification loss	5.3 – 7.0
Indefinable content	0.2

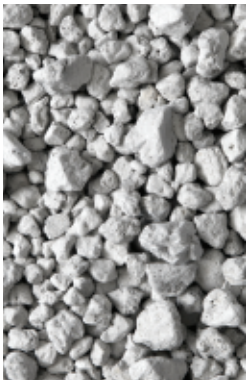
LAVA provides to its clients pumice stone in the following five (5) different granulometries (or mixtures of them):


0-3 mm


0-8 mm


2-10 mm


0-16 mm


16-40 mm

LCA INFORMATION

EPD TYPE
Product specific.

DECLARED UNIT
The declared unit is 1 tonne (1.000 kg).

GOAL AND SCOPE
This EPD evaluates the environmental impacts of the production of 1 tonne Pumice Stone (various granulometries) from Cradle-to-gate.

BACKGROUND DATA
A combination of Ecoinvent v.3.7 and Professional 2021 databases was used.

PRODUCT SUSTAINABILITY SOFTWARE
GaBi ts version 10.5.0.78

DATA QUALITY
The primary data were collected and provided by **LAVA MINING & QUARRYING SA** and cover the full year 2020. The GaBi ts version 10.5.0.78 was used as LCA software and a combination of Ecoinvent v.3.7 and Professional 2021 databases was used for generic data. Regarding electricity mix, the latest (2019) national residual electricity mix as published in DAPEEP S.A. was utilized, where the GHG emissions are equal to 0.6014 kg CO_2/ kWh.

TIME REPRESENTIVENESS
All primary data used in this study are for the entire year 2020.

GEOGRAPHICAL SCOPE
Worldwide

ASSUMPTIONS
This LCA study describes the impacts of pumice stone produced in **LAVA MINING & QUARRYING SA**. quarry in Yali island, Greece, using aggregated values, taking into account the different granulometries of the extracted mineral. Differences in energy consumption in the extraction and production of different pumice granulometries, are considered to be marginal, as the production process is the same.

ALLOCATION
100% of the natural aggregates produced in Yali's island quarry are covered by the framework of this EPD. No allocation of total site energy and fuel used, as well as emissions occurred, was required. Therefore, the flows of materials and energy, as well as the associated emission releases into the environment, are related exclusively to the production of 1 tonne pumice stone.

COMPARABILITY
EPDs of construction products may not be comparable if they do not comply with EN 15804. EPDs within the same product category but from different programmes may not be comparable.

CUT-OFF RULES
All raw materials and consumable item inputs, associated internal transports within the quarry, as well as process energy use, are included in the LCA study. It is considered that the total potential neglected input flows are much less than 0.1% of total energy, area, area-time activities and mass. All associated processes specific data are determined and modelled by the use of generic data provided by the integrated GaBi databases.

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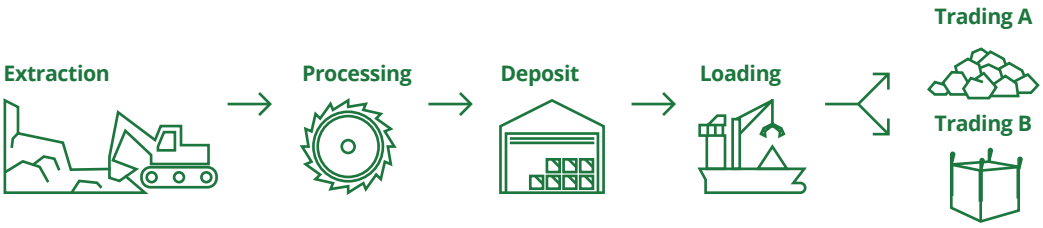
SYSTEM BOUNDARY

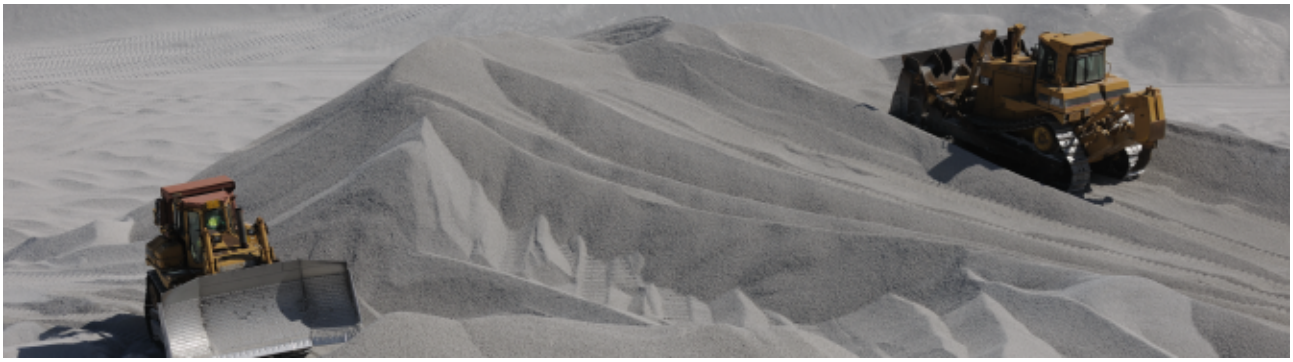
The scope of this study is “Gradle to gate” covering the product stage (modules A1-A3), since the product fulfills the three conditions required by EN 15804:2012+A2:2019, about the exclusion of modules C1-C4 and D. Pumice Stone is incorporated in cement paste for the production of lightweight concrete, lightweight mortar and cement products (cement block) and cannot be separated at the end-of-life stage. The system boundaries concern the Product Stage and include the raw material production and supply (A1), internal transportation (A2) and production (A3) stage.

X= Included, MND= Module Not Declared

Product Stage			Construction Stage		Use Stage							End-of-life Stage				Resource Recovery
Raw Materials Supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction and demolition	Transport	Waste processing for reuse, recovery and/or recycling	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

PRODUCTION PROCESS





The production process at the site begins with the extraction of the material from the benches. The exploitation is superficial and is carried out by the method of benches with the use of a propeller. The material is extracted with bulldozers by cutting the material into small horizontal strips and pushing it to the front of the slope, ensuring that the front surface descends evenly, while at the base of the formed pile is installed a technical metal tunnel. Inside the tunnel there is a conveyor belt which receives the excavated material through doors (tamper) that the tunnel has on its roof. Then, as the material is received from the conveyor belts which are inside the metal tunnel, it is advanced through the conveyor belts to the processing plant where the size of the material is reduced by crashers and separated by sieves into the according granulometries. Then, through conveyor belts, the material is deposited in open-air storage areas, ready for shipping.

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ENVIRONMENTAL PERFORMANCE INDICATORS

ENVIRONMENTAL IMPACTS per 1 tn Pumice Stone		Unit	A1-A3
GWP-total	Global warming potential – total	kg CO2 eq	2.196
GWP-fossil	Global warming potential – fossil	kg CO2 eq	2.164
GWP-biogenic	Global warming potential – biogenic	kg CO2 eq	-0.039
GWP-luluc	Global warming potential – luluc	kg CO2 eq	0.071
GWP-GHG[1]	Global warming potential – GHG	kg CO2 eq	2.144
ODP	Ozone Depletion Potential	kg CFC-11 eq	6.692E-15
AP	Acidification Potential	mol H+ eq	0.040
EP-freshwater	Eutrophication potential - freshwater	kg PO4-3 eq	1.850E-04
EP-freshwater[2]	Eutrophication potential - freshwater	kg P eq	6.027E-05
EP-marine	Eutrophication potential - marine	kg N eq	0.024
EP-terrestrial	Eutrophication potential - terrestrial	mol N eq	0.260
POCP	Photochemical oxidant formation Potential	kg NMVOC eq	0.066
ADPe[3]	Abiotic depletion potential - Elements	kg Sb eq	5.243E-07
ADPf[3]	Abiotic depletion potential - Fossil resources	MJ	54.724
WDP[3]	Water scarcity potential	m3 eq	0.085

[1] This indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide emissions and uptake and biogenic carbon stored in the product with characterization factors (CFs) based on IPCC (2013). This indicator is thus equal to the GWP indicator originally defined in EN 15804+A1:2013.
[2] Eutrophication aquatic freshwater shall be given in both kg PO_4^{-3} eq and kg P eq.
[3] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

RESOURCE USE per 1 tn Pumice Stone		Unit	A1-A3
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	1.681
PERM	Use of renewable primary energy resources used as raw materials	MJ	-
PERT	Total use of renewable primary energy resources	MJ	1.681
PENRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	54.842
PENRM	Use of non-renewable primary energy resources used as raw materials	MJ	-
PENRT	Total use of non-renewable primary energy resources	Mj	54.842
SM	Use of secondary material	kg	-
RSF	Use of renewable secondary fuels	MJ	-
NRSF	Use of non-renewable secondary fuels	MJ	-
FW	Use of net fresh water	m^3	0.0030

OUTPUT FLOWS AND WASTE CATEGORIES per 1 tn Pumice Stone		Unit	A1-A3
HWD	Hazardous waste disposed	kg	6.057E-10
NHWD	Non-hazardous waste disposed	kg	0.045
RWD	Radioactive waste disposed	kg	4.762E-04
CRU	Components for re-use	kg	-
MFR	Materials for recycling	kg	-
MER	Materials for energy recovery	kg	-
EE	Exported energy	MJ	-

The product is delivered in bulk, thereof no packaging material is used. Also, the product does not contain any biogenic carbon content.

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INTERPRETATION

As seen from the resulted tables, LAVA MINING & QUARRYING SA Pumice Stone is an environmentally friendly natural aggregate with extremely low CO_2 emissions and natural resources deprivation. Most environmental impacts associated with aggregate mining are benign. Land use activities, alongside with electricity and diesel consumption, are the main contributions to the formation of the environmental impacts. Electricity use during stages A1-A3 accounts for the 49% of the Climate Change – total indicator. Therefore, approximately half of the total CO_2 emissions are attributed to electricity generation and consumption.

ADDITIONAL INFORMATION

LAVA SA hereby declares that pumice stone is in compliance with the REACH Regulation (EC) No 1907/2006, concerning the Registration, Evaluation, Authorization and Restriction of Chemicals. Pumice does not contain any Substances of Very High Concern (SVHC) currently on the candidate list. REACH SVHC list is not static and is updated frequently thus the company will continue to evaluate, research and review to fulfil the demands of the regulation. More information about product safety handling is available at the Safety Data Sheet (SDS) published at the company's website www.lava.gr.

The EPD does not give information on release of dangerous substances to soil, water and indoor air because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonized test methods according to the provisions of the respective technical committees for European product standards are not available.

REFERENCES

- **GPI v.3.01:2019-09-18** General Programme Instructions of the International EPD® System
- **PCR 2019:14 v.1.11** Product Category rules | Construction products | The International EPD® System
- **EN 15804:2012+A2:2019** Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products
- **ISO 14020:2000** Environmental labels and declarations - General principles
- **ISO 14025:2006** Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- **ISO 14040:2006** Environmental management - Life Cycle Assessment - Principles and framework
- **ISO 14044:2006** Environmental management - Life Cycle Assessment - Requirements and guidelines
- **The International EPD® System** – The International EPD System is a programme for type III environmental declarations, maintaining a system to verify and register EPDs as well as keeping a library of EPDs and PCRs in accordance with ISO 14025 – www.environdec.com
- **Ecoinvent Centre**| www.Eco-invent.org
- **DAPEEP SA**: Renewable Energy Sources Operator & Guarantees of Origin | Greece | www.dapeep.gr
- **Sphera** | GaBi Product Sustainability Software | www.sphera.com

LAVA MINING AND QUARRYING Co

CONTACT INFORMATION

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Verifier	EURO CERT	Chlois 89, Athina 144 52, Greece email: info@eurocert.gr www.eurocert.gr

PROGRAMME-RELATED INFORMATION

Product group classification: UN CPC 163

The CEN standard EN 15804 serves as the core Product Category Rules

PCR 2019:14 Construction products (EN 15804:A2); Version 1.11; 2021-02-05

PCR review was conducted by
The Technical Committee of the International EPD® System.

Independent third-party verification of the declaration and data in accordance with ISO 14025:2006
☐EPD process certification ☒EPD verification

Procedure for follow-up during EPD validity involves third party verifier
☒Yes ☐No

The EPD owner has the sole ownership, liability and responsibility of the EPD.

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